



Water Quality NewsFlash

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Mission Bay Bacteria – DNA tracks sources – Mission Bay is an enclosed marine bay used by millions of residents of the San Diego area for recreation. The State Water Resources Control Board has added the Bay to the 303(d) list of impaired waterways because of elevated bacteria levels in the Bay. The City obtained Proposition 13 grant funds from the State Water Resources Control Board to identify bacteria sources using genetic fingerprinting (DNA analysis). The results showed that the host origins of the bacteria were birds (67%), dogs (9%), humans and marine mammals (5% each), other mammals (4 %), and unknown (10%).

A similar 2002 DNA study in Morro Bay found that the four most important sources of *E. coli* bacteria in waters of Morro Bay were birds (24%), humans (17%), cattle (15%) and dogs (9%).

Morro Bay study – <http://www.swrcb.ca.gov/rwqcb3/MorroBayDNA/Reports/MBDNAFinalReport.pdf>

At Mission Bay, the indicator bacteria (fecal coliform and enterococcus) were apparently transported to the receiving waters by storm drains, creeks, irrigation runoff, and direct deposition (i.e., birds). The study found that grassy areas of the park that surrounds the bay contain a large reservoir of both fecal coliform and enterococcus, mainly from birds. Groundwater was not a source of these bacteria and they were virtually absent at 18-inches in depth. Also, sediment from storm drains and streams were found to be only minor bacterial contributors. Bacteria from humans appeared to result from activities on the beach rather than from boats, restrooms, sewers, or storm drains. Bird droppings on the upper intertidal beach sands contributed to relatively high levels of fecal coliform and enterococcus. When these areas are disturbed (e.g., by swimmers or other activity), the bacteria are released into the water column. Lower intertidal beach sands did not exhibit this pattern.

An interesting component of the Mission Bay study was an assessment of “bacterial amplifiers.” Investigators found that the wrack line (organic debris including eel grass and algae deposited at high spring tide) acted like a bacteria incubator. As a result, subsequent high spring tides that reached the wrack line picked up a significant bacteria load. This corresponds to a Huntington Beach study which found that bacteria levels were “generally more correlated with the maximum daily tide range, than with the concentration of bacteria in the last sample” (see *NewsFlash* 04-14). A similar study at Campbell Cove on Bodega Bay suggested that bacterial regrowth in the sand contributed to the persistent high bacteria levels in this location which has no sources other than wildlife (http://www.sonoma-county.org/health/eh/ocean_testing.htm).

A parallel epidemiological study at Mission Bay found that the frequent exceedances of bacteria standards did not translate into significantly elevated health risk for beachgoers. It is likely that bacteria from birds presents less risk than bacteria from human sources such as sanitary sewer overflows. Researchers also could not find a link between the types of illnesses contracted by beachgoers and the types of bacteria that are monitored (fecal coliform, *E. coli* and enterococcus bacteria). <http://www.signonsandiego.com/news/metro/20041016-9999-2m16swim.html>

The presence of uncontrollable sources such as birds, as well as the possible presence of bacterial amplifiers may impact goals and strategies for implementation of TMDLs that target waterways with elevated bacteria. Mission Bay study: http://www.stormh2o.com/sw_0505_mission.html

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